

Important tips on indexing.

By John Dyer

Now before you go and get all excited I would like to reassure you that I am NOT talking about some dubious stock market scheme. We all have seen far too many of those over the years. Instead I am referring to an important subject for those looking to make the transition from a cutter of beginning to intermediate skill to one who can cut more rapidly and with fewer indexing mistakes.

While Gemcad and the many diagrams available today have been a wonderful tool for the beginning cutter many people have gotten stuck on “cutting by the numbers.” They slavishly read each and every index number on the diagram without really coming to an understanding of WHY that is the correct index and WHY the design works if you do it that way.

The following technique has allowed me and many other professional cutters to cut with much more efficiency than that of the beginning faceter. As another gem cutter once said, “Most of the cutting time is spent with the gem NOT in contact with the lap.” So the less time you have to spend thinking about what you are going to do or hunting for the correct index the more time you spend with the gem actually in contact with the lap and the more efficient a cutter you become. Once you get comfortable with this technique it will also enable you to develop new cuts on the fly without having to use Gemcad to find each index on a tier of facets.

The concept can be difficult to explain but it will be extremely helpful in your hobby or trade. You will find that once you have gotten the hang of things it is very simple to cut this way. Those numbers on the index gear are there so you can locate the correct index or “notch” of the index gear. Yet if you can free yourself from a dependence on the numbers you will begin to understand much more of the cutting process. Most gems are based on a certain number of “sides” which are often referred to as a “2,3,4,5,6,8 or 10 fold symmetry” in the diagrams generated by Gemcad.

Think of it this way; a square has how many sides? The answer is obviously 4, so when you are cutting a square gem you have 4 sides and what I will call a “base index” that represents each side. Everything else is based on these 4 sides and “base indexes.” All indexes or facets should be placed in reference to those 4 sides. If you are using a 96 index gear then the basis of your whole design (for a square) will be the indexes of 96, 24, 48 and 72. Even if your gem is a square cushion and you do not actually cut a single facet on these indexes you should still orient all of your facets relative to them.

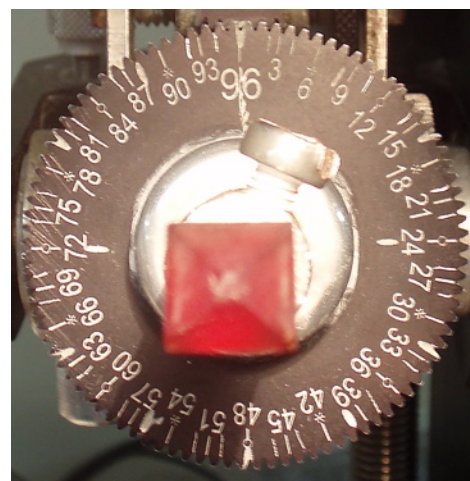


3 to right or +3



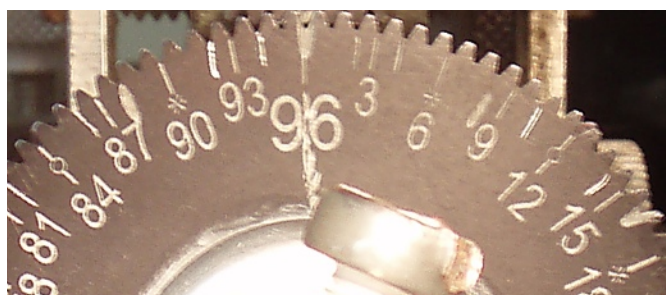
3 to left or -3

As an example, I do not think of indexes as 3 and 93, I think of them as three teeth to the left and three the right of the first “base index” which is 96. Since we are using an equal sided square as an example then this would repeat on all 4 sides. If I cut a facet 3 indexes to either side of 96 then obviously there will be a facet 3 indexes to each side of 24, 48 and 72 as well! So instead of reading the diagram and discovering that 24 minus 3 is 21 and 24 plus 3 is 27 you can quickly just index three teeth to either side of your “base index” teeth. You can do so without even paying attention to the numbers of those indexes you are cutting on. This speeds up cutting considerably. Also since you are repetitively using a certain number of indexes to each side of your “base index” the repetition helps you not to make an indexing mistake.



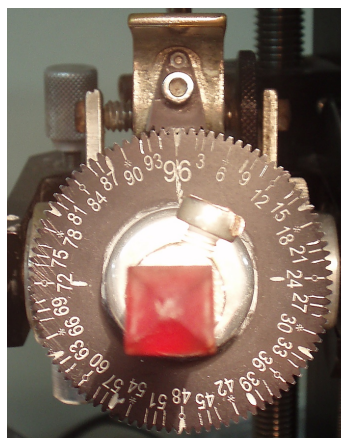
If you understand this concept and you know what the index of one facet on one side of the gem is you can cut the entire tier of facets. You will be able to find the correct indexes for every other facet in that tier or “row” of facets with only this information. If for example the gem is a symmetrical square and has a facet on index #3 you should automatically know that there will be facets 3 teeth to each side of every “base” index. (The base indexes for a square using a 96 index are 96, 24, 48 and 72 as you recall.)

In an attempt to aid people who use this faceting technique many index gears from different manufacturers have distinctive markings of some kind to help the faceter orient themselves in relation to the symmetry or “base indexes” that they are using. Ultra Tec for example has a small 4 next to each 4 fold “base” index, a small 8 next to each 8 fold index, a small 3 next to each 3 fold index and a small 6 next to each 6 fold index. Other manufacturers often use colored dots or other types of symbols or marks on the index gear to aid the faceter. There are some index gears that do not have any more than the traditional numbers for each index on the index gear. If your machine does not have these distinctive markings for the “base indexes” you can make them on the gear in a manner which does not interfere with its operation. Disclaimer: This is done at your own risk. Power tools should be used with appropriate care and following the owners manual cautions. The results will depend on your own care and skill and thus I can assume no responsibility for what happens. It could possibly even void some warranty.

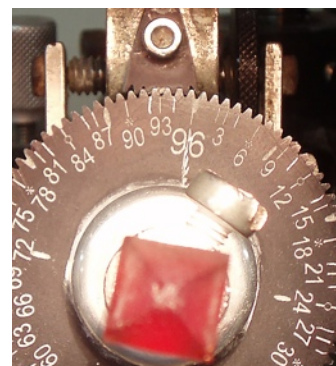


A close-up photograph of a mechanical dial, likely from a vintage clock or watch movement. The dial is dark, possibly black or dark brown, with white or light-colored numbers and markings. The numbers 8, 16, 24, 32, 40, and 48 are clearly visible, arranged in a circular pattern. There are also smaller, less distinct numbers and markings between the main ones. A pointer, which is part of the mechanical assembly, is visible at the top of the dial, pointing towards the 32 mark. The dial is mounted on a metal frame, and various mechanical components are visible in the background.

Here is an old Ultra Tec index gear that the markings wore off of and I remarked. You can see various types of markings that I used to show the different base indexes and symmetries to make cutting more efficient. (New gears from Ultra Tec are etched so the numbers should not wear off.)



Since we are talking about indexing and mistakenly choosing the wrong index I would like to encourage you to cultivate a new habit. Glance at the gem each time after you choose the index and as you are lowering it to the lap. On an Ultra Tec as I change the index setting I am practically sighting down the gem and looking at the index gear so in effect I see both at the same time. When doing this it often becomes very clear if I misindex because the rotational orientation of the gem will “look wrong.” In this way I often catch myself before cutting a facet where I had no intention of having one.



If you think you are on the base index and the gem looks like this (not straight) then something is wrong.

If your machine allows you to simultaneously see both the index gear and the gem then it also becomes more obvious how the “base indexes” relate to the shape of the gem. If it is a square gem then there will be a 96 index exactly in the middle of one flat side. 24 will be



exactly in the middle of the other and so on. Remember, the shape of the gem is what is supposed to dictate the index, and NOT the index dictate the shape of the gem. All the index is supposed to do is “true up” the basic shape of the rough or preform that you started with. Anything else will result in a large loss of rough material as you try to conform the shape of the rough to a different cut than that which it would “like to be.”

While I have used the example of a square gem for simplicity and consistency this same concept works easily with any shape of gem except for a freeform. Even when cutting a freeform you will find the concept of orienting yourself according to “base indexes” somewhat helpful once you understand it.

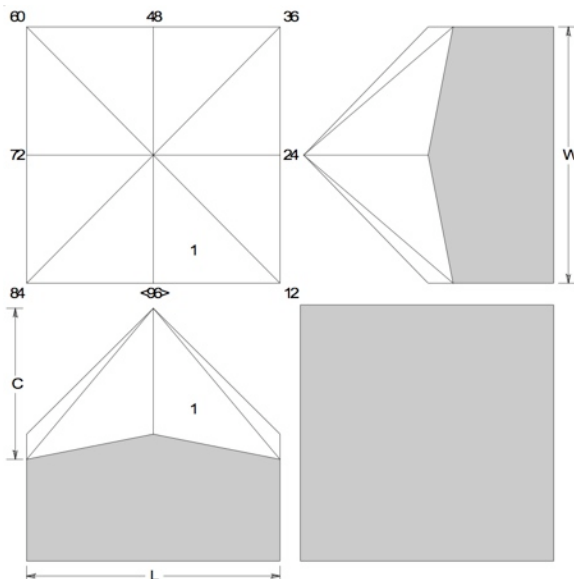
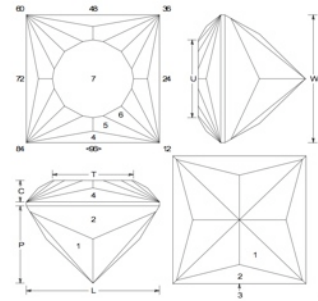
I remember as a beginner using the “recipe” (diagram) for a round brilliant and it seemed almost like magic as facets materialized in the right place. But just as is the case with almost all magic it only seems like magic because we do not comprehend how it works. Once we understand the concept then we can achieve the same results ourselves.

As an exercise which will help you better understand these concepts I am including a diagram and step by step instructions on how to cut the gem. This diagram will differ in one key way from most others, I will only list ONE index number per tier of facets. By cutting this simple design you will see how you can cut an entire row or tier with no more information than that first index, the angle and where the facet is supposed to meet.

This is a relatively simple design to illustrate the principle I am talking about. It will probably look best in medium to smaller sizes since it doesn't have a ton of facets. The angles are what I might use for quartz of some variety with no more than medium color. If you want to do it in beryl, garnet that isn't too dark, tourmaline or other higher RI material just change the angle of the pavilion mains to 43 or 42 degrees and cut the rest per the diagram as is.

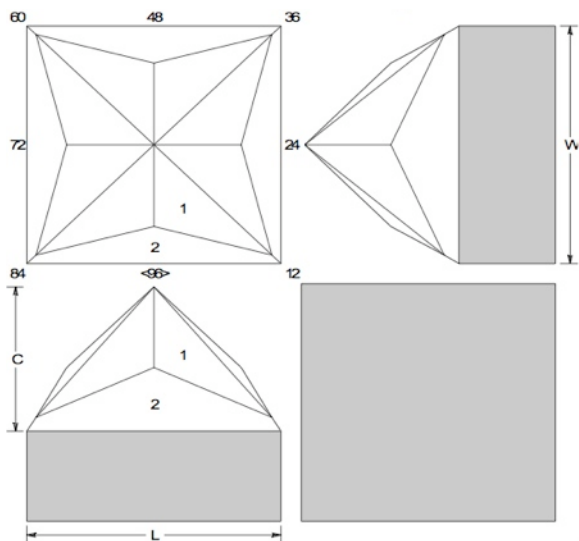
Orient your preform or rough so that when you look at it head on in the machine with the index at 96 it looks like it does in the diagram.

Cut 8 facets at 45 degrees (Tier #1), your first index is 3.



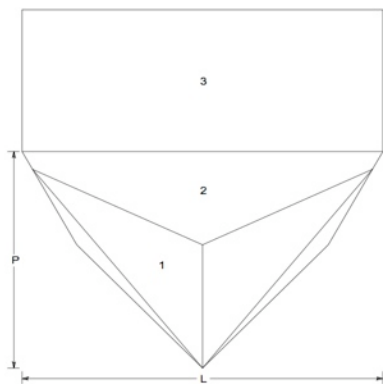
So were you able to figure out what all the other indexes were? They should be 03-21-27-45-51-69-75-93 in “Gemcad lingo.” Here we see another bad habit that Gemcad can cause beginning cutters. If you follow these instructions in the order that Gemcad gives you will end up not cutting all the facets as pairs. You should cut the facets on 3 AND 93 first in most cases, but if you follow the instructions as Gemcad renders them this is the first and the last facet you cut instead of the first and second. The rest of the Gemcad instructions are correct as all the other facet pairs come one after the other.

Now to continue our simple cut we will cut one more tier of facets on the pavilion at 60 degrees, the first facet is at 96. The fact that we cut the facet exactly on 96 which is one of our “base indexes” should tell you that this tier has only ONE facet per side and you should be able to easily locate the other indexes in relationship to the shape of the gem.



The gem should look like this after step #2.

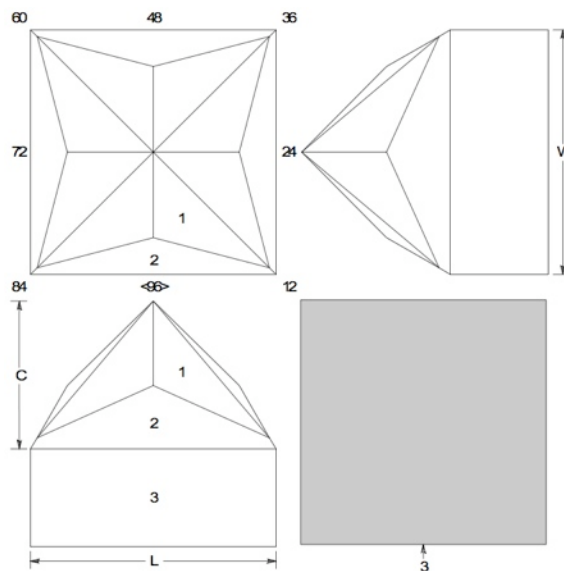
Now transfer the gem according to your preferred method and start on the crown.



After transferring the gem should look like this with the exception of the fact that there will be a dop stuck to the pavilion.

Everyone will run into this alignment problem at some point if they cut any number of gems. You should learn how to deal with it sooner or later. I almost always make it a practice to cut the first tier of the crown all the way around to a meet with the girdle far thicker than I want it. This is just in case I did not get the gem straight in the machine or I had a problem with my transfer. (I do not have time or space here to deal with transfer issues. However if it is a transfer problem you will notice that the facets are not always higher on the same side, some will be higher on the right and some will be higher on the left. Or you will notice that the girdle is thicker on one side of the gem than the other even though the facets meet. These transfer issues are a bit trickier to deal with.)

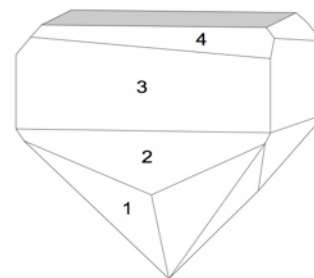
Now cut your girdle at 90 degrees. If you want a level girdle and understand these basic concepts it should be obvious that you must cut the girdle on the 96 index and the other "base indexes," the same indexes as the facets above the girdle facets [tier #2]. To do otherwise would result in a non level girdle.



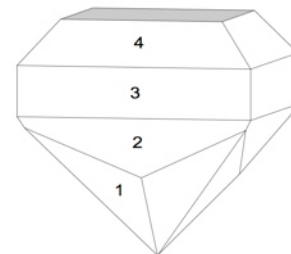
After step #3 (the girdle) it should look like this.

Now cut a tier of facets at 50 degrees starting with 96. (Obviously it will be four facets once again.) Leave them far short of where you would need to cut them for correct girdle thickness, this is just to check and see if your transfer and alignment are correct.

If your gem looks like this, with one side of each facet higher than the other and the same side (the left in this case) higher all the way around the gem then you do not have your gem properly "centered" and aligned in the machine on the 96 index. The easiest way to fix this in my opinion is to use the "cheater" to rotate the gem slightly and recut the facets. When you get the correct adjustment on the cheater all of your facets will come in straight and meet at the corners.



Gem that is poorly aligned in the machine.

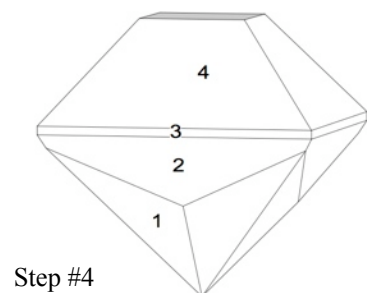


Properly aligned gem.

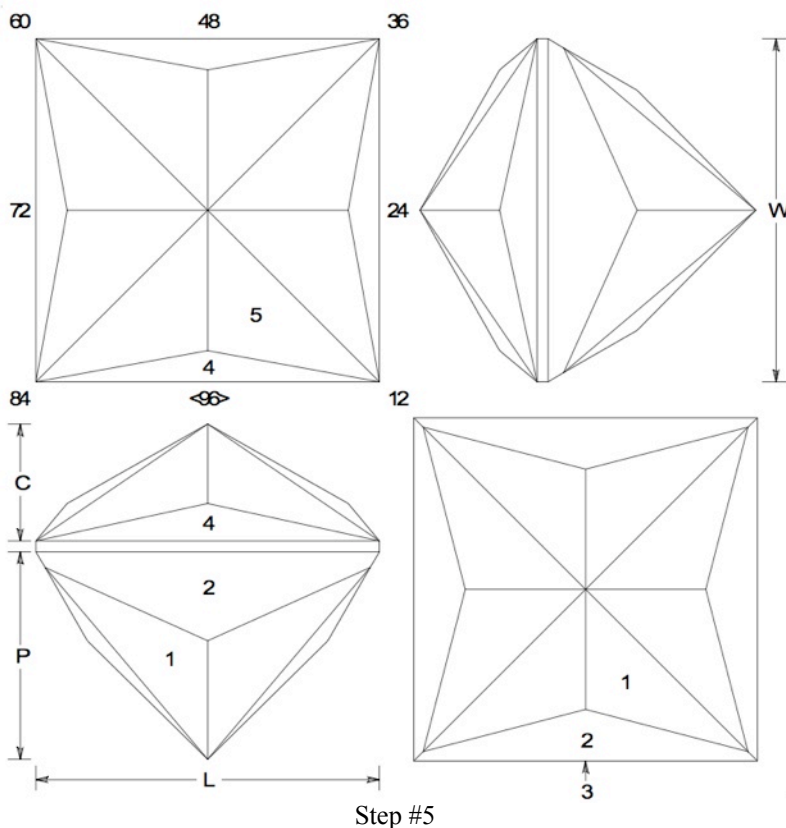
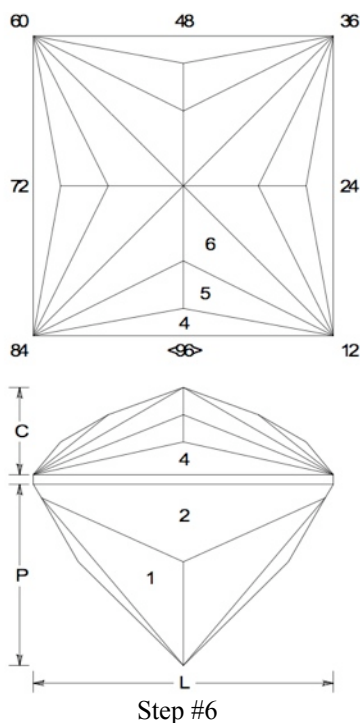
Although I recommend that you use the cheater to straighten out the gem if you did not get the dop in the quill with the correct orientation it is vital to also learn that you should NOT rotate the cheater between facets on the same tier. Change the cheater and then cut all four of the facets at the SAME cheater setting without messing with it more. If it still is not quite right change the cheater setting a bit more and cut ALL FOUR facets again. Keep doing this until the facets are straight all the way around and they meet each other. Never cut one facet on one cheater setting and the other in the same tier on another or you will create a big mess for yourself which will be hard to fix.

Now cut tier # 4 down to the proper girdle width.

Then cut another tier (#5) at 30 degrees starting with index number 3.

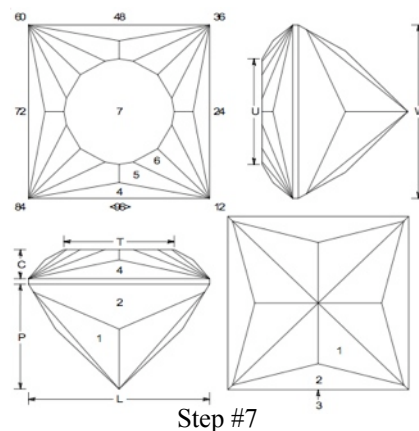


Cut another tier (#6) at 23 degrees starting with index number 8. The results should look like the diagram below. If you did not have enough rough for the facets to meet in the middle as in the picture this may be OK. The table facet comes next and will remove this point in the middle anyway.



Now cut the table at 0 degrees (#7) on any index you want or use a tabling adapter which will do the same thing. Make the table as big as pleases you, the size shown is approximately what I recommend in this case although smaller is OK.

Step #7 is what your finished gem should look like. I hope that through this you have come to understand what I am describing. If not then keep trying, with time and repetition you will become more familiar with these concepts. I had to discover all this for myself so it took me some time to fully understand the idea.



AUTHORS NOTE:

Gemcad is a very useful tool for some applications and even writing this article would have been very difficult without the illustrations it generates. However the use of Gemcad based diagrams sometimes causes new faceter to acquire certain bad habits and lack a basic understanding of how faceting diagrams work, or causes them to cut in a less efficient manner. In the end this is more the fault of the end user than the program but unless someone takes the time to explain these things it take much longer to find them out on your own.



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Email johnddyer at Yahoo . Com (There are two “d”s in my email address, the weird format is to try to keep automated spambots from picking it up since I posted this article on my site www.ultratecfacetingmachine.com , to use it you will have to delete all the spaces and substitute the “at” for @.)

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